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COMPARISON OF DIFFERENT METHODS OF HARVESTING COTTON

Division of Agricultural Engineering
and Division of Agronomy
in
Cooperation with the Production and
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The cotton trade has looked with disfavor on the rougher methods of harvesting cotton, such as hand-snapping and machine harvesting both with the picker type and the stripper type mechanical harvesters. This was largely because the lint from the roughly harvested cottons contained more foreign matter than cotton picked by hand. Textile workers have thought that the manufacturing or spinning performance of cottons harvested by hand-snapping, machine-stripping, and machine-picking would be of inferior quality as compared with the manufacturing and spinning performance of hand-picked cotton.

A study was made covering a three-year period, 1943-1945, of the effects of method of harvesting on the spinning performance. The four harvesting methods used were: hand-picked, hand-snapped, machine-picked and machine-stripped. Each of the four methods was used in harvesting four varieties of cotton which were selected because of their widely differing fiber properties.

Tests conducted during 1943, 1944 and 1945 at both College Station and Lubbock show that the difference in the percentage of burs and trash removed from cotton harvested by hand-snapping and by machine-stripping is not significant. However, when varieties are compared one with another the difference in the content of the burs and waste is significant. More motes and trash were removed in the cleaning and ginning of cotton that had been machine-picked. In the cleaning and ginning processes more motes and trash were removed from short staple, hand-picked cotton than from the longer staple cottons that were harvested by hand-snapping and machine harvesting. Since the machine-picked and hand-picked samples contained no burs they were not run through an extractor prior to ginning as was the case with the hand-snapped and machine-stripped cotton, which did contain burs.

Fiber properties and classers staple length were not appreciably affected by the method of harvest. The grade, however, was significantly affected by the method of harvest. The hand-picked cottons averaged one to two grades higher than the other methods of harvesting.

The spinning tests show that the most important factor of manufacturing quality as affected by method of harvesting is that of the amount of waste or foreign matter in the lint.

In the manufacturing processes there was a significant increase in picker and card waste for roughly harvested cotton as compared with hand-picked cotton, especially for the longer staple cottons. Relatively small differences were found in picker and card waste content between the hand-snapped samples and the machine-harvested samples of the short staple cottons.

The quality of the yarn manufactured was not affected by the method of harvesting except for a slight lowering of the appearance grade for the longer and finer fibered cottons.

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The cotton trade has looked with disfavor on hand-snapping and machine harvesting of cotton. Often the farmer has suffered price penalties because of the method of harvesting. In the January, 1943, issue of *Textile World*, the statement was made that, "no spinning tests are available on machine-picked cotton, so for all practical purposes the mechanical picker cannot be universally accepted until such tests are made and until they meet the spinners' requirements." Therefore, in 1943 the Texas Agricultural Experiment Station and the Production and Marketing Administration of the U. S. Department of Agriculture began a study to determine the effects on the comparative spinning qualities of cotton harvested by three different methods, namely, hand-picking, hand-snapping, and machine-stripping. No mechanical picker was available in 1943. In 1944, through the cooperation of the International Harvester Company, a fourth method of harvesting, machine-picking, was included in the study. The results of three years' work, 1943-1945, are given in this bulletin.

AGRONOMIC ASPECTS

The work was done at College Station in east Central Texas and at Lubbock in Northwest Texas. These areas differ greatly in climatic conditions, such as the amount of rainfall, the number of days between frosts, and the temperatures, particularly the night atmosphere. There is also a difference in the soil type and the altitude of the two locations. Lubbock is located on the High Plains in Northwest Texas approximately 500 miles northwest of College Station. All of these factors affect the development of the plant, making a difference in the height of the plant, the length of the fruiting and vegetative branches, and in general, the development of the plant.

Varieties

Varieties of cotton differing widely in their fiber properties were selected for the study in 1943: Hi-Bred, because of its short, coarse staple, and Deltapine because of its medium staple. In 1944, the varieties were changed to include the more commonly grown varieties: Hi-Bred, Deltapine, Rogers Acala and Macha. Macha was selected for its stormproof qualities and suitability for machine stripping. Rogers Acala was selected

because of its longer staple and good spinning qualities. These same varieties were grown in 1945 at both College Station and Lubbock.

Height of Plants

College Station.—The growth and size of the plants of the varieties at College Station were about normal in 1943 and 1944 and varied little between varieties. In 1945, however, the plants at College Station were larger than normal plants and more foliage was collected in harvesting with the machines, particularly with the stripper. The plant height for Hi-Bred and Deltapine for the years 1943 and 1944 was approximately 27 inches. The three-year average for these two varieties, however, was approximately 30 inches. Rogers Acala and Macha averaged 31 and 32 inches in height respectively for the three years.

Lubbock.—At Lubbock, where the cottons were grown under conditions of less rainfall, the plants were much smaller. The average height ranged from 18½ inches for Macha to 23 inches for Rogers Acala. The average for all four varieties for the three-year period was approximately 20 inches.

Yields

Yields for the various varieties at each of the locations also varied. At College Station, the three-year average yield of lint for the different varieties was slightly less than 300 pounds per acre while at Lubbock the average yield for all varieties was approximately 400 pounds of lint per acre.

Harvesting Conditions, Dates of Harvest and Defoliation

In 1943, at College Station, the Hi-Bred and Deltapine varieties were quite fluffy at harvest time. In 1944, rains occurring at frequent intervals created a damp condition which caused the boll stem and bur to become rotten and brittle and easy to break off. The locks of cotton in the bur for all varieties were also quite compact and more difficult to pick, especially with a mechanical picker. In 1945, somewhat similar conditions of bolls and cotton existed, and in addition the plants were much larger and were covered with heavy, tender growth of foliage. Because of the extreme storm resistance of the Macha cotton and because it was not suited to machine-picking, no effort was made to use the mechanical picker on this variety in 1945 at either of the two locations.

The conditions under which the cottons were harvested at Lubbock during each of the three years were quite similar and the varieties, with the exception of Macha, were fairly fluffy. All the varieties at the time of harvest at Lubbock were well matured with practically all bolls open.

At College Station, the cotton was harvested by the various methods on September 9 in 1943 and on September 14 in 1944. In 1945, however, the hand-picked, hand-snapped, and machine-picked cottons were harvested on September 18. The stripped samples were not harvested that year until October 11 because a tractor was not available on which to mount the stripper.

At Lubbock, in 1943, the samples were harvested on October 20, which is earlier than usual. The plants had matured early and calcium cyanamid (defoliant) was applied to remove the leaves, thus exposing the bolls to sunshine so that they opened earlier and were ready for harvest two or three weeks before frost. In 1944 and 1945, the cottons were harvested on November 8. During each of these two years calcium cyanamid had also been applied to the plants to remove the leaves. The cotton in 1944 and 1945, however, did not mature as early as in 1943 which accounts for the later date of harvest.

Defoliant was also applied to the cotton plants at College Station each year, but rather poor results were obtained in 1943 and 1945. In 1943 dry weather apparently prevented good defoliation. In 1945, heavy rains occurring prior to the time the cyanamid was applied caused the plants to put on new growth and even though the old foliage was removed by the defoliant, a new growth occurred with such rapidity that by the time the stripper was used the plants were practically in full foliage. This caused an excessive amount of green leaf to be collected in harvesting the cotton with the stripper. Very little green leaf was collected in harvesting the cotton at College Station in 1944. At Lubbock, good defoliation was obtained each year and practically no green leaf was collected in harvesting the cottons with either type of machine.

ENGINEERING ASPECTS

The engineering aspects of this study can be divided into three sections; namely, harvesting, extracting, and cleaning and ginning.

Harvesting

Generally, the hand-harvested cottons, both the picked and snapped, were harvested one or two days before the cottons were harvested with the machines. Ordinary labor was used to pick and snap the samples at both College Station and Lubbock.

All of the machine-stripped samples were harvested with the Texas Station Harvester, developed by the Texas Agricultural Experiment Station,[1] at each location each year, with the exception of 1945 at Lubbock when a two-row, tractor mounted, John Deere Stripper was used. The machine-picked samples at Lubbock in 1944 were harvested with an International Harvester low-drum picker. The samples machine-picked at College Station in 1944 and 1945 were harvested with an International Harvester high-drum type of picker.

Extracting

All the hand-snapped and machine-stripped samples harvested at College Station were extracted with the Texas Station Bur Extractor.[2] The hand-

[1]Texas Station Bulletins 452, 511 and 580.
[2]Texas Station Bulletins 511 and 580.

snapped and machine-stripped samples harvested at Lubbock in 1943 and 1944 were extracted with the Texas Station bur extractor, but the samples harvested in 1945 were extracted with a Mitchell gin stand extractor.

Cleaning and Ginning

After the samples of uncleaned seed cotton from all of the methods of harvesting had been extracted they were bagged and shipped to the U. S. Cotton Field Station at Stoneville, Mississippi, for cleaning and ginning. When the cotton had been cleaned and ginned it was then shipped to the U. S. Cotton Testing Laboratory at College Station, Texas, for the fiber and spinning tests.

WASTE REMOVED IN EXTRACTING, CLEANING, AND GINNING

Hand-snapped and machine-stripped cotton requires two processing treatments to remove the waste before the cotton is ginned. The first treatment removes the burs and loose dirt and trash. This is done with special bur extracting equipment and before any cleaning is done. The second treatment, using special cleaning machinery, removes much of the foreign matter left in the seed cotton by the extractor. Additional amounts of trash and waste in the cotton are removed in the actual ginning process, the gin throwing off by centrifugal force a large percentage of the motes and waste material.

Waste Removed by Extracting

The data in Table 1 show that the average percentage of burs and waste removed by extracting in the field harvested, hand-snapped and machine-stripped cotton, amounts to approximately one-fourth to one-third of the total. The bulk of this weight is burs. The data do not show any significant differences in the precentage of waste for the two methods of harvesting when the same variety is considered. There is a greater range in the percentage of waste between varieties and between locations than between the methods of hand-snapping and machine-stripping.

Table 1. Percentage of the original sample removed as waste and burs from field harvested hand-snapped and machine-stripped cotton grown at College Station and Lubbock, 1943-1945

Harvest method	Variety			
	Hi-Bred	Macha	Deltapine	Rogers Acala
	College Station			
Hand-snapped	34.0	33.6	36.3	37.7
Machine-stripped	34.0	30.7	36.0	37.1
	Lubbock			
Hand-snapped	31.0	21.0	29.6	29.6
Machine-stripped	28.5	22.6	28.2	29.1

Waste Removed in Cleaning and Ginning

The percentage of waste removed in the cleaning and ginning operations is shown in Table 2, and graphically in Figure 1. In studying the data and by referring to Figure 1, it is seen that a higher percentage of the total amount of motes and trash was removed from the machine-picked cottons at both College Station and Lubbock than from cotton harvested by hand-snapping, hand-picking and machine-stripping. Ordinarily, it is expected that the rougher methods of harvest, such as hand-snapping and machine-stripping, would have a higher percentage of waste. The data

Table 2. Percentage of the seed cotton removed as waste in cleaning and ginning four varieties of cotton grown at College Station and Lubbock and each harvested by four methods, 1943-1945

Variety	Harvest method	Percent of motes and trash removed			
		1943	1944	1945	Average
		College Station			
Hi-Bred	Hand-picked	2.9	8.5	6.1	5.8
	Hand-snapped	4.4	4.6	2.5	3.8
	Machine-picked		8.4	6.2	7.3
	Machine-stripped	4.3	3.5	5.3	4.4
Macha	Hand-picked		3.6	3.5	3.6
	Hand-snapped		8.2	6.4	7.3
	Machine-picked		14.1		14.1
	Machine-stripped		6.1	7.4	6.8
Deltapine	Hand-picked	2.1	7.9	4.9	5.0
	Hand-snapped	5.2	6.8	4.6	5.5
	Machine-picked		13.8	5.3	9.6
	Machine-stripped	5.3	5.4	7.1	5.9
Rogers Acala	Hand-picked		2.7	3.9	3.3
	Hand-snapped		6.0	3.8	4.9
	Machine-picked		11.4	5.4	8.4
	Machine-stripped		4.7	5.4	5.1
		Lubbock			
Hi-bred	Hand-picked	5.2	3.1	4.1	4.1
	Hand-snapped	4.8	3.1	4.3	4.0
	Machine-picked		7.4		7.4
	Machine-stripped	3.8	4.1	4.1	4.0
Macha	Hand-picked	4.2			4.2
	Hand-snapped	7.5	8.0	13.3	9.6
	Machine-picked				
	Machine-stripped	7.3	9.6	14.1	10.3
Deltapine	Hand-picked		2.1	4.7	3.4
	Hand-snapped		5.0	6.1	5.5
	Machine-picked		7.6		7.6
	Machine-stripped		8.1	6.5	7.3
Rogers Acala	Hand-picked		2.3	3.1	2.7
	Hand-snapped		4.1	5.2	4.6
	Machine-picked		4.8		4.8
	Machine-stripped		4.2	5.1	4.7

obtained in this study do not show this to be true. It is interesting to note that hand-picked Hi-Bred samples had a higher percentage of motes and trash than did either the hand-snapped or machine-stripped samples for each of the locations. It can be expected that the extracting equipment will do a certain amount of cleaning in conjunction with the extracting process. The hand-picked and the machine-picked samples did not contain burs and, therefore, were not treated in any manner to remove foreign material between the harvesting and the cleaning and ginning operation. This, no doubt, affected the percentages of motes and trash in the cotton harvested by these two different methods.

Fiber Tests

As stated in the foregoing sections, the cotton varieties used in this study were chosen because their generally known fiber characteristics represent a relatively wide difference in fiber properties. Each variety of cotton, by each method of harvesting at each of the two locations, was classified for grade and staple, and was measured on the fibrograph for upper half mean length, mean length, and uniformity ratio. It was assumed that since fineness, maturity, and fiber strength are mainly varietal properties, and to only a limited extent are affected by environmental condi-

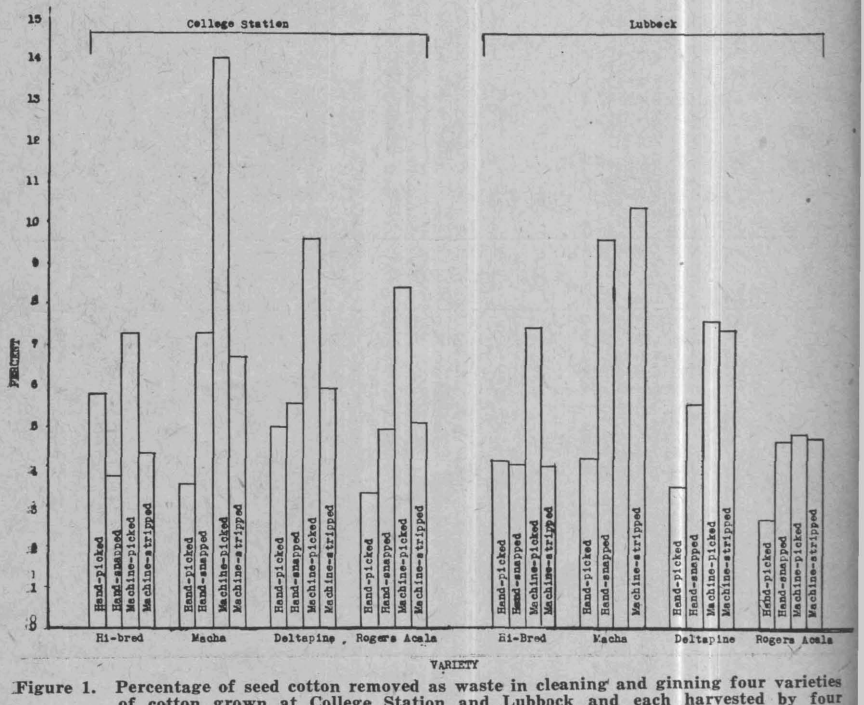


Figure 1. Percentage of seed cotton removed as waste in cleaning and ginning four varieties of cotton grown at College Station and Lubbock and each harvested by four methods, 1943-1945.

tions, they would not be affected by the methods of harvesting. Accordingly, only the hand-picked cottons of 1943 were measured for these properties. Because of the possibility of mechanical damage in harvesting and ginning of the non-hand-picked cottons, it was deemed desirable to measure the strength of the fiber for each method of harvesting for the 1944 and 1945 crops. Detailed classification and fiber test results are listed in Table 3 according to location, variety, and method of harvesting.

Results indicate that method of harvesting very definitely affected the

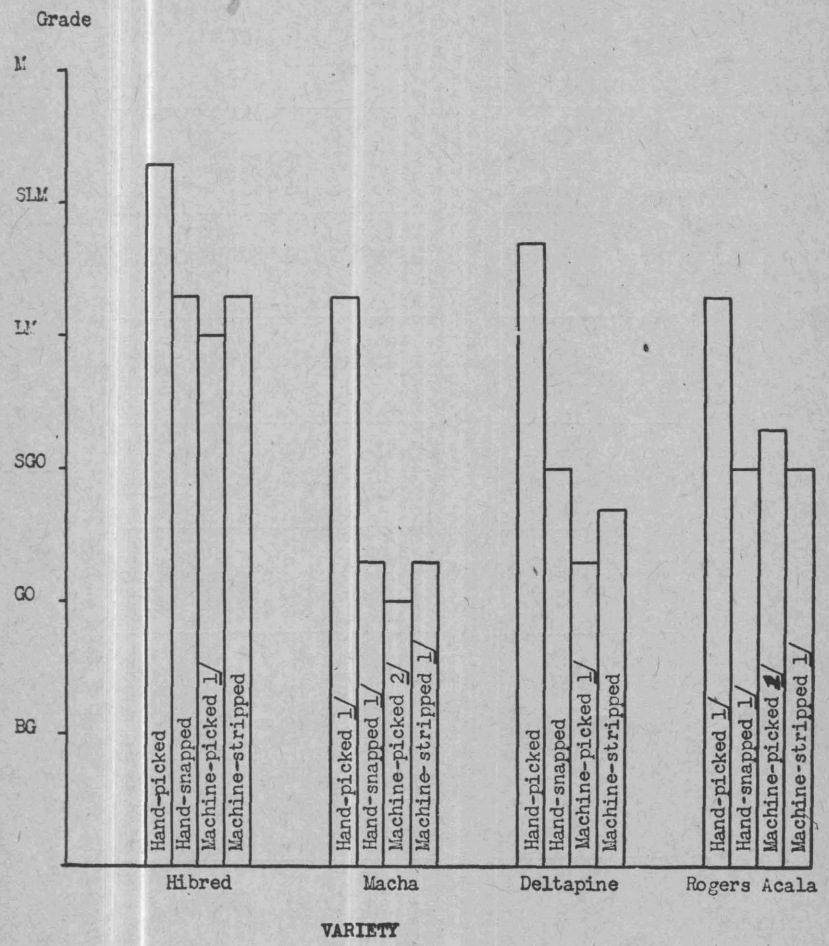


Figure 2. Three-year average for grade of cottons grown at College Station and harvested by different methods, 1943-1945.

Table 3. Three-year average for commercial classification and fiber measurements for four varieties of cotton grown at two Texas locations and harvested by four different methods, 1943-1945

Variety	Harvest method	Commercial classification		Fiber laboratory test results					
				Length fibrograph			Fineness (weight per inch of fiber)	Mature fibers	Fiber[1] tensile strength
		Grade	Staple length	Upper half mean	Mean	Uniformity ratio			
			32nd inch	inch	inch	Index	Micrograms	%	1000 lb. per sq. in.
College Station									
Hi-Bred	Hand-picked	SLM+	25	.69	.57	82	5.0	70	80
	Hand-snapped	LM+	26	.72	.58	80			80
	Machine-picked[2]	LM	26	.72	.58	80			82
	Machine-stripped	LM+	25+	.70	.56	80			80
Macha	Hand-picked[2]	LM+	27	.77	.61	79	4.2	66	84
	Hand-snapped[2]	GO+	27	.76	.59	78			86
	Machine-picked[3]	GO	26	.73	.56	77			90
	Machine-stripped[2]	GO+	26	.76	.60	78			84
Deltapine	Hand-picked	SLM—	30	.88	.67	77	4.0	71	82
	Hand-snapped	SGO	29+	.88	.66	76			83
	Machine-picked[2]	GO+	29+	.90	.69	76			83
	Machine-stripped	SGO—	29—	.87	.65	75			84
Rogers Acala	Hand-picked[2]	LM+	29+	.86	.65	76	3.6	74	90
	Hand-snapped[2]	SGO	31	.87	.66	76			93
	Machine-picked[2]	SGO+	30+	.89	.66	74			92
	Machine stripped[2]	SGO	30	.88	.66	75			94

Table 3—Continued.

Lubbock

Hi-Bred	Hand-picked	M	25+	.76	.61	81	5.5	74	76
	Hand-snapped	SLM	26	.76	.60	80			75
	Machine-picked[3]	LM	26	.74	.61	82			78
	Machine-stripped	LM+	27—	.76	.59	78			78
Macha	Hand-picked								
	Hand-snapped[2]	LM+	28	.87	.68	78	4.7	66	74
	Machine-picked								
	Machine-stripped[2]	SGO+	29+	.84	.64	76			72
Deltapine	Hand-picked	SLM	31	.98	.74	76	4.1	71	74
	Hand-snapped	LM—	32—	.98	.74	75			74
	Machine-picked[3]	SGO	32	.98	.76	78			70
	Machine-stripped	SGO	31	.96	.72	75			71
Rogers Acala	Hand-picked[2]	M+	33	1.00	.75	76	3.9	72	84
	Hand-snapped[2]	LM	32	.98	.72	74			84
	Machine-picked[3]	LM	33	.95	.71	75			83
	Machine-stripped[2]	LM	32+	.94	.70	74			80

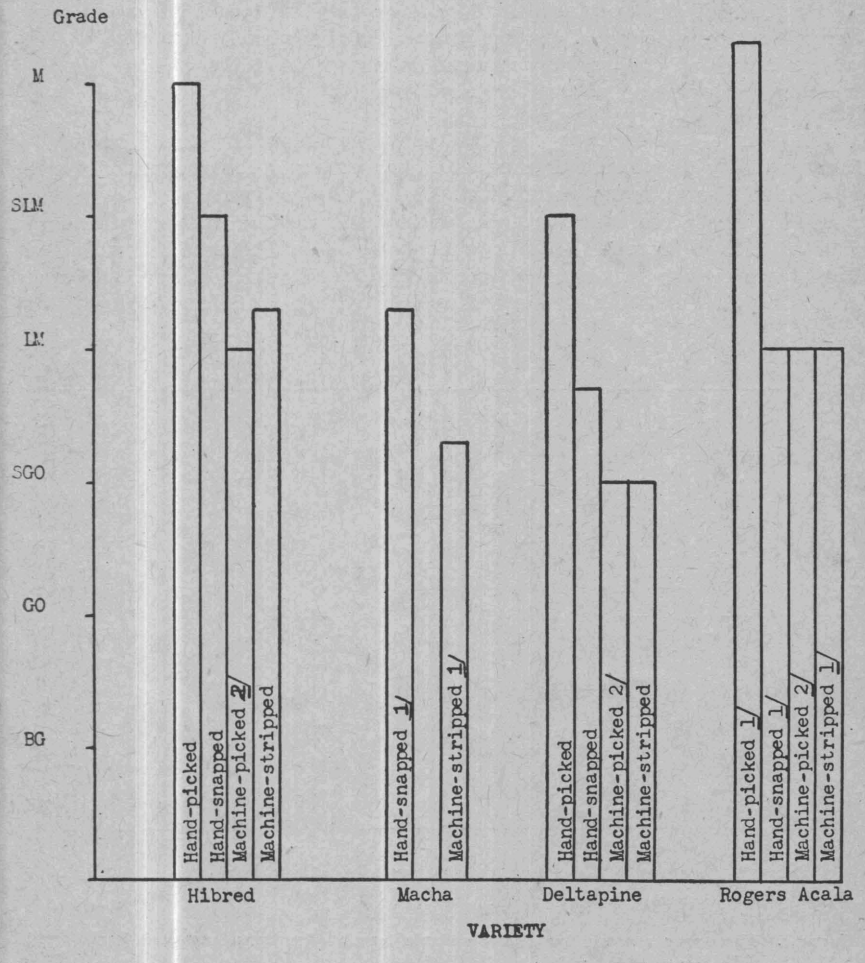
[1]Corrected from Pressley index according to the following formula: Tensile strength = (10.8116 x Pressley index) —0.12
[2]Average of 1944 and 1945 crops only.
[3]1944 crop only.

Table 4. The average manufacturing performance, Shirley Analyzer waste and yarn quality for four varieties of cotton grown at two Texas locations and harvested by four different methods, 1943-1945

Variety	Harvest method	Waste		Skein strength of carded yarns						Equivalent staple length[2]	Neps per 100 sq. in. card web	Yarn appearance[3]					
		Shirley Analyzer	Picker and card	22s	36s	Third count spun[1]						22s	36s	Third count spun[1]			
						14s	44s	50s	60s					14s	44s	50s	60s
		%	%	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	32nd inch	No.	grade					
College State																	
Hi-Bred	Hand-picked	4.6	8.7	80.1	40.1	129.6				25—	11	B+	B+	B+			
	Hand-snapped	5.6	10.1	80.6	41.1	133.0				25	10	B+	B	B+			
	Machine-picked[4]	6.2	10.8	83.2	41.8	137.2				25+	7	B+	B	B+			
	Machine-stripped	6.2	10.3	80.6	40.1	131.5				25—	10	B+	B	B+			
Macha	Hand-picked[4]	5.4	9.3	88.8	46.2	135.8	34.8			27	22	B+	B	B+	B		
	Hand-snapped[4]	9.4	15.0	90.0	46.3	142.3	35.5			27+	28	B	C+	B+	B		
	Machine-picked[5]	14.0	17.1	92.6	51.5	145.3				29	27	B	C+	B+			
	Machine-stripped[4]	10.2	15.1	90.0	45.6	142.8	33.2			27+	24	B	C+	B+	B		
Deltapine	Hand-picked	6.3	8.8	98.1	52.8		37.3	36.2		32—	38	B	B		C+	C+	
	Hand-snapped	10.0	12.0	98.4	52.3		39.0	32.8		31	29	B	C+		C+	C+	
	Machine-picked[4]	10.2	13.2	99.6	53.2		40.5	33.5		31+	36	B	C+		C+	B	
	Machine-stripped	12.0	14.5	96.3	51.0		38.3	32.0		31—	39	B	C+		C+	C+	
Rogers Acala	Hand-picked[4]	4.6	7.4	106.8	57.6		41.8	36.2		33+	24	B+	B		B	C+	
	Hand-snapped[4]	8.0	10.9	106.8	57.0			35.2		33+	25	B	C+			C+	
	Machine-picked[4]	9.1	12.5	109.0	59.8		45.1	37.3		34+	28	B	C+		C+	C+	
	Machine-stripped[4]	8.6	12.6	106.5	58.3		44.4	36.3		34+	39	C+	C+		C+	C+	
Lubbock																	
Hi-Bred	Hand-picked	3.0	7.5	81.7	40.8	137.7				25+	10	B+	B+	B+			
	Hand-snapped	4.6	8.7	84.4	42.2	139.3				26	14	B+	B+	B+			
	Machine-picked[5]	5.0	9.0	82.2	41.7	134.0				26	4	B+	B+	B+			
	Machine-stripped	4.8	9.3	84.2	41.7	140.0				26+	12	B+	B+	B			
Macha	Hand-picked Hand-snapped[4]	6.3	14.0	86.8	45.0		32.0	28.6		27+	25	B	C+		B	C+	
	Machine-picked Machine-stripped[4]	10.2	15.4	87.8	45.7		33.8	29.1		27+	25	B	C+		C+	C+	
Deltapine	Hand-picked	5.1	7.7	99.1	52.7			33.8		32—	19	B	B			C+	
	Hand-snapped	6.6	10.1	99.1	51.9			33.8		31+	20	B	C+			C+	
	Machine-picked[5]	8.5	12.8	93.8	48.3			31.9		30	17	B	C+			C+	
	Machine-stripped	10.8	13.1	98.2	51.5			32.9		31+	30	B	C+			C+	
Rogers Acala	Hand-picked[4]	3.3	5.8	107.6	57.2				27.1	34	20	B	C+				C+
	Hand-snapped[4]	6.8	9.4	104.7	55.4				27.0	33	38	C+	C				C+
	Machine-picked[5]	5.5	7.4	103.6	55.1				26.1	33	24	B	C+				C+
	Machine-stripped[4]	7.7	10.2	100.5	54.4				26.5	32+	46	C+	C				D+

[1]Figures listed in these columns indicate count spun.
[2]Average for three counts of yarn.
[3]In accordance with yarn appearance standards of American Society for Testing Materials.
[4]Average for 1944 and 1945 crops only.
[5]Average for 1944 crop only.

grade of cotton, but had little effect on the staple length. The three-year average of the grade for each variety and method of harvesting is shown in Figure 2 for College Station and in Figure 3 for Lubbock. Similar averages for classers staple length are illustrated in Figure 4 for both College Station and Lubbock. The other methods of harvesting for each variety averaged from approximately one to two grades lower than the hand-picked samples at both locations. The various methods of harvesting for each variety averaged within approximately 1/32 inch of each other without any consistent relationship between staple length and method of harvesting used.



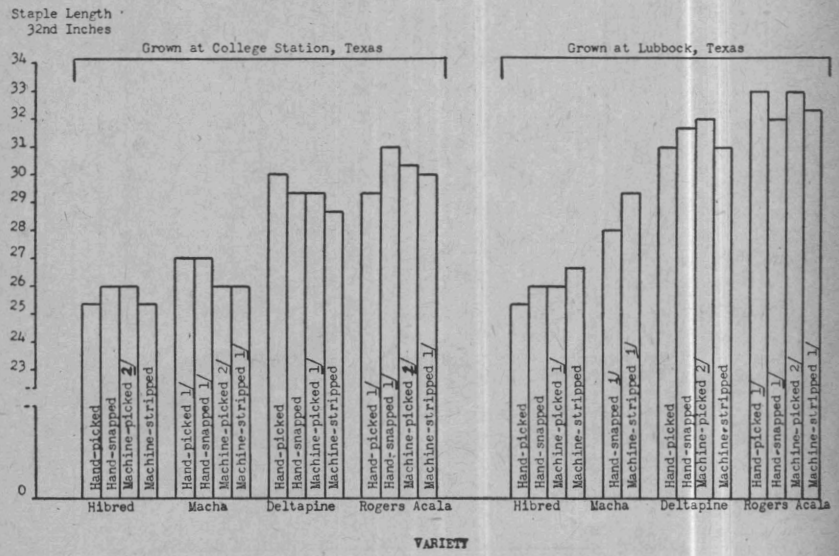
1/ 1944 and 1945 crops only
2/ 1944 crop only

Figure 3. Three-year average for grade of cottons grown at Lubbock and harvested by different methods, 1943-1945.

SPINNING TESTS

Complete spinning tests were made on samples of each variety harvested by the various methods for each crop year at College Station and Lubbock. Measurements made in these tests included percentage of ginned lint removed as picker and card waste, neps per 100 square inches of card web, skein strength and yarn appearance grades of three counts of yarn, and equivalent staple length. The 1943 and 1944 samples were manufactured by using the conventional or regular draft system. The 1945 samples were manufactured by using the long draft system and the yarn strengths were adjusted to the regular draft level by using the formula worked out by the U. S. Department of Agriculture. In addition to the spinning tests, Shirley Analyzer waste tests were made on the 1944 and 1945 samples to determine the amount of foreign matter in the ginned lint. The three-year average of the results obtained is shown in Table 4 according to location, variety, and method of harvesting.

The spinning tests show that the most important factor of manufacturing quality as affected by method of harvesting is the amount of waste or foreign matter in the ginned lint. The three-year average of the picker and card waste removed for each variety and method of harvesting are illustrated in Figure 5 for College Station and in Figure 6 for Lubbock. The waste for the two locations are on different levels but show the same trends between methods of harvesting. The Shirley Analyzer waste show



1/ 1944 and 1945 crops only
2/ 1944 crop only

Figure 4. Three-year average for classer's staple length of cottons harvested by different methods, 1943-1945.

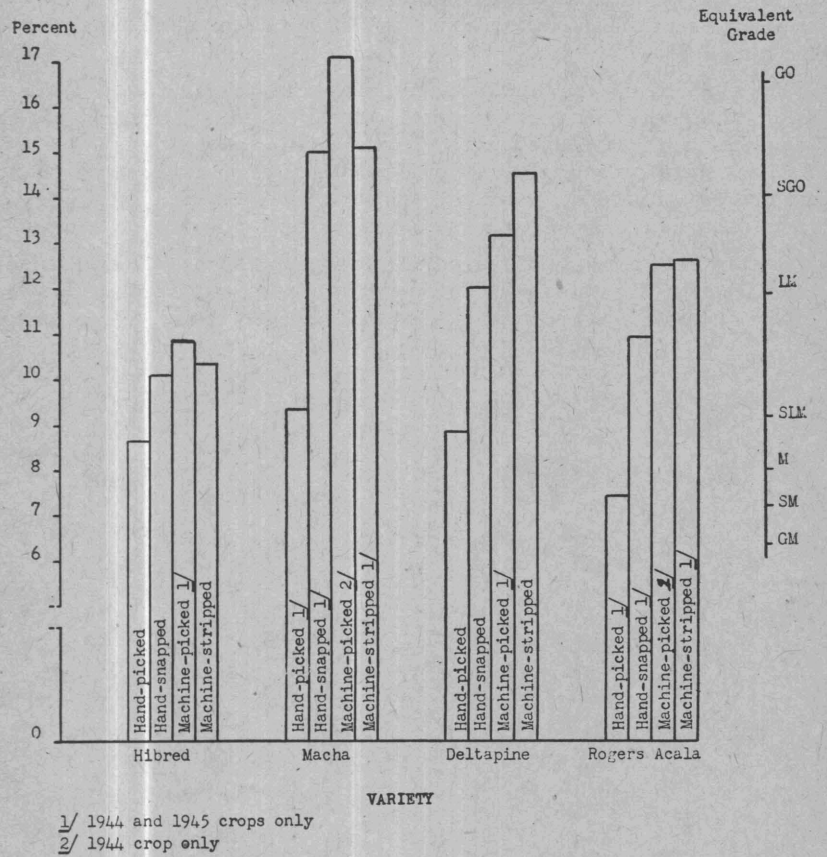


Figure 5. Three-year average of picker and card waste removed from cottons grown at College Station and harvested by different methods, 1943-1945.

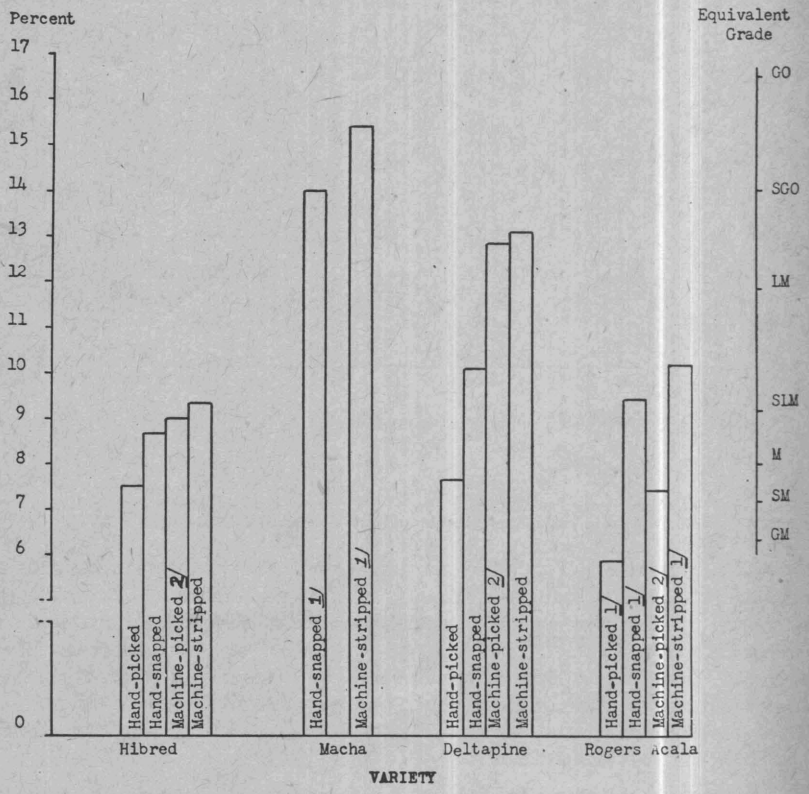
the same general relationship as do picker and card waste. The differences between the waste removed from the hand-picked samples and those harvested by the various other methods are relatively small for the short, coarse-fibered cottons. In the case of the longer and finer cottons, however, the hand-snapped, machine-picked, and machine-stripped samples show a larger increase in waste as compared with the hand-picked cottons. These results are in line with popular opinion concerning the cleanability of short, coarse-fibered cottons.

The increase in the waste for the hand-snapped and machine harvested samples as compared with the hand-picked samples is quite significant, especially for the longer staple cottons, and would be objectionable in manufacturing even though it is largely removable. The use of such cotton in a manufacturing plant, in addition to the extra waste loss,

would put an extra burden on the cleaning machinery and would probably necessitate the installation of additional cleaning equipment, as well as creating undesirable working conditions owing to excessive impurities in the air.

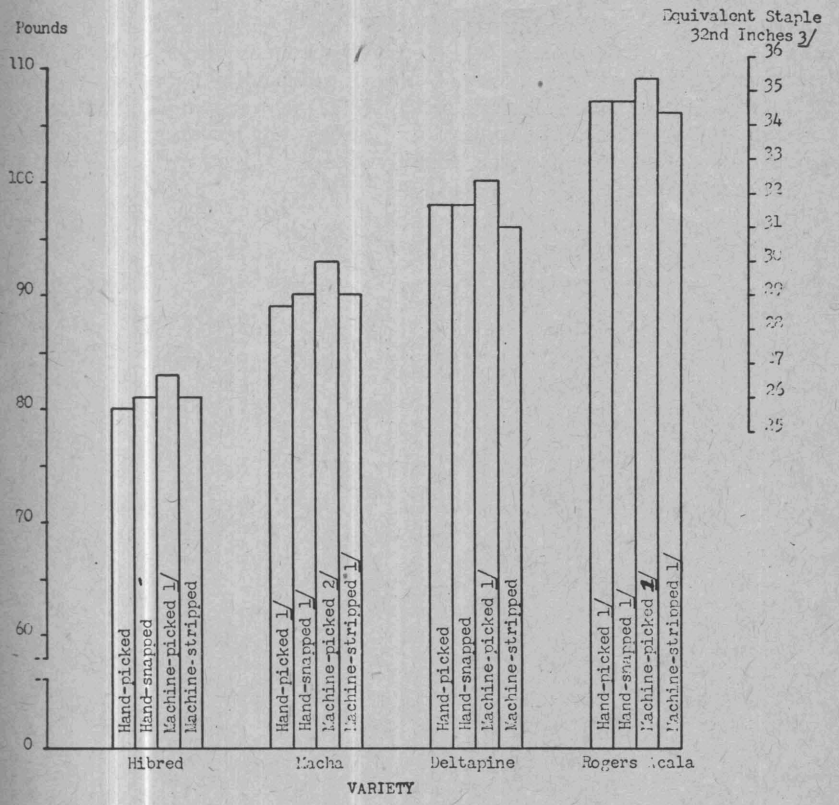
The most significant item in these data is the fact that only relatively small differences occurred in waste content between the hand-snapped samples and the machine-harvested samples on the short staple cottons. As hand-snapping is generally considered the standard harvesting method for the Plains area of Texas and shorter staple cotton is widely grown, there should be little objection to machine harvesting in that area.

Quality measurements of the yarns show the same trends for the various counts spun. The three-year average of skein strength of 22s yarn together with its equivalent staple length for each variety and method of



1/ 1944 and 1945 crops only
2/ 1944 crop only

Figure 6. Three-year average of picker and card waste removed from cottons grown at Lubbock and harvested by different methods, 1943-1945.



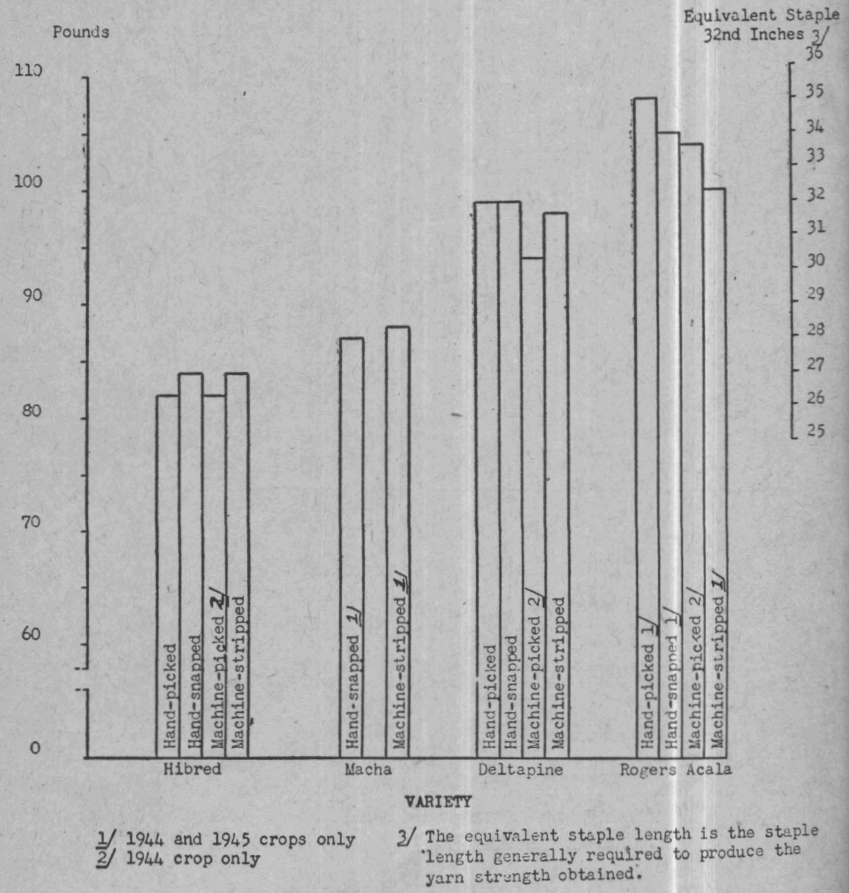
1/ 1944 and 1945 crops only
2/ 1944 crop only
3/ The equivalent staple length is the staple length generally required to produce the yarn strength obtained.

Figure 7. Three-year average for skein strength of 22's yarn from cottons grown at College Station and harvested by different methods, 1943-1945.

harvesting are illustrated in Figure 7 for College Station and in Figure 8 for Lubbock. There were large differences in yarn strength between varieties but little difference could be attributed to the harvesting method employed. The yarns from machine-picked cottons, however, had a tendency to be slightly stronger than the yarns from cottons harvested by the other methods.

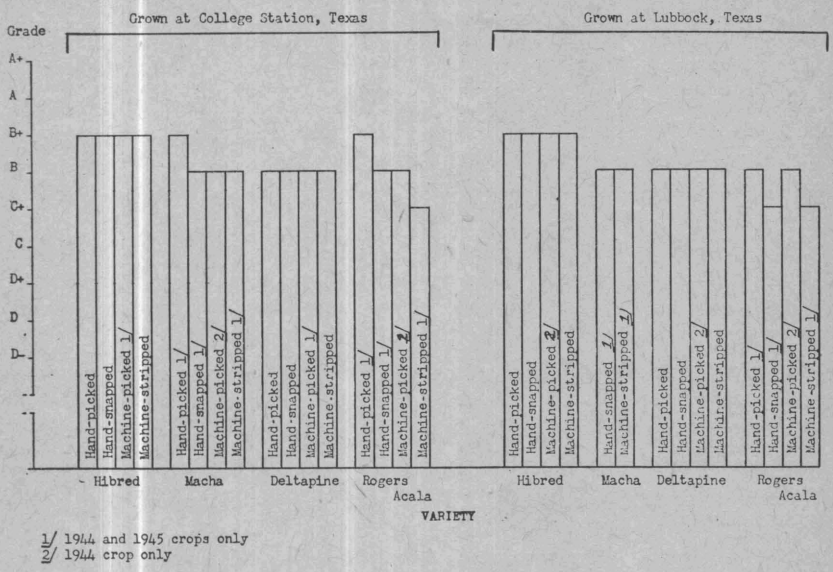
Yarn appearance, in addition to yarn strength, is an important item in evaluating the quality of yarn produced from a cotton. The yarn appearance for 22s yarns for each variety and method of harvesting for

the three-year period is illustrated in Figure 9 for both College Station and Lubbock. Since most of the foreign matter is removed from cotton in preparatory cleaning processes before it reaches the spinning operation, it is logical that little damage is done to the yarn appearance due to method of harvesting. The appearance grades did, however, show a tendency to drop slightly for the roughly harvested cottons, especially for the longer staples.



1/ 1944 and 1945 crops only
2/ 1944 crop only
3/ The equivalent staple length is the staple length generally required to produce the yarn strength obtained.

Figure 8. Three-year average for skein strength of 22's yarn from cottons grown at Lubbock and harvested by different methods, 1943-1945.



1/ 1944 and 1945 crops only
2/ 1944 crop only

Figure 9. Three-year average for appearance of 22's yarn from cottons harvested by different methods, 1943-1945.

SUMMARY AND CONCLUSIONS

Data presented in this bulletin were collected during the three-year period, 1943-1945, inclusive, on four varieties of cotton grown at two locations, College Station and Lubbock. Each variety was harvested by four methods when adequate equipment was available. The four methods of harvesting the cottons were the commonly practiced methods: hand-picking, hand-snapping, machine-stripping and machine picking.

Four varieties of cotton differing widely in their fiber properties were selected for the study: Hi-Bred because of its coarse, short staple, Macha because of its stormproof qualities, Deltapine because of its medium staple length, and Rogers Acala because of its longer staple and better spinning quality.

All samples were cleaned and ginned by the U. S. Cotton Field Station at Stoneville, Mississippi, and the fiber and spinning tests were made by the U. S. Cotton Testing Laboratory at College Station.

Data on the percentage of burs and waste removed from hand-snapped and machine-stripped cotton did not show a significant difference. There was an apparent significant difference, however, in the percentage of burs and waste removed when varieties are compared.

The highest percentage of motes and waste removed from the cotton in cleaning and ginning was found in samples from the machine-picked method of harvest. This cotton had not been run through an extractor

prior to ginning as was the case with the hand-snapped and machine-stripped cotton.

More motes and waste were removed from the Hi-Bred, short staple, hand-picked samples than were removed from the rougher methods of harvesting—hand-snapping and machine-stripping. The results were reversed for the stormproof and longer staple varieties, Macha, Deltapine and Rogers Acala.

Fiber properties and classers staple length were not appreciably affected by the method of harvest. The grade, however, was very significantly affected by the method of harvest. The hand-picked cottons averaged one to two grades higher than the other methods of harvesting.

Spinning tests show that the most important factor of manufacturing quality as affected by method of harvesting was that of the amount of waste or foreign matter in the lint.

The increase in picker and card waste for roughly harvested cotton as compared with hand-picked cotton was significant, especially for the longer staple cottons.

Relatively small differences were found in picker and card waste content between the hand-snapped samples and the machine-harvested samples of the short staple cottons.

Method of harvesting had little effect on the quality of the yarn manufactured except for a slight lowering of the appearance grade for the longer and finer fibered cottons.

ACKNOWLEDGMENTS

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